DE FOREST, LEE (*b.* Council Bluffs, Iowa, 26 August 1873; *d.* Hollywood, California, 30 June 1961), *electronics.*

Lee de Forest grew up in Alabama, where his father, Henry Swift De Forest, a Congregational minister of Huguenot stock, was president (1879–1896) of the Negro Talladega College. His mother was Anna Margaret Robbins, the daughter of a Congregational minister.

After preparation at the Mt. Hermon School in Massachusetts, de Forest entered the three-year mechanical engineering course of the Sheffield Scientific School at Yale University. He graduated in 1896 and returned for graduate work under such luminaries as Josiah Willard Gibbs and Henry Bumstead. De Forest enlisted in the army during the Spanish-American War but saw no action, and he received the Ph.D. on schedule in 1899 with a thesis entitled "Reflection of Hertzian Waves From the Ends of Parallel Wires."

From the first de Forest was interested in radiotelegraphy, and his improvements on the early systems enabled him to obtain financing to compete with Marconi and to interest the U.S. Army and Navy in his equipment. Apparatus constructed by de Forest and his associates was used in an attempt to report the America's Cup yacht races of 1903; and in the early part of the Russo-Japanese War of 1904–1905, his equipment was used by European reporters in sending their news dispatches, until the Japanese put an end to the arrangement.

A search for an improved detector (rectifier) of radio signals led de Forest to an invention that was a substantial improvement over the vacuum diode invented in 1904 by J. A. Fleming: the insertion of a third, control electrode between cathode and anode. De Forest applied for a patent on this "device for amplifying feeble electric currents" in 1906, but this first triode initially served only as a superior detector. A careful reading of the contemporary literature on the subject, exegesis of the subsequent claims made by de Forest (partly for purposes of patent litigation), and additional information unearthed by historical research make it clear that he neither fully understood the operation of the triode nor appreciated its possi-

bilities as an amplifier and high-frequency oscillator until years later. In fact, the triode saw very limited use until after 1912, when Fritz Löwenstein invented the negatively "biased grid" circuit for it and H. D. Arnold and Irving Langmuir set about providing the highest attainable vacuum. But that is not to say that this prototype of all electronic amplifiers was not an invention of the greatest significance, matched in importance only by the invention of the transistor some forty years later. The triode made transcontinental telephony possible for the first time and underlies all technological applications in which weak electrical signals are amplified—including the transistor, which is a type of triode.

Following active participation in the development of the infant radio industry in New York, de Forest went to work for the Federal Telegraph Company in Palo Alto, California. He made California his permanent residence and continued to make inventions at an astonishing rate; he was granted more than 300 patents, many quite speculative, in his lifetime. Besides the triode, de Forest's most important contributions were made in the development of sound motion pictures. He was one of the founder members of the Institute of Radio Engineers in 1912, and in 1915 he received its Medal of Honor. He also received the Elliott Cresson Medal of the Franklin Institute and the Cross of the Legion of Honor from the French government.

De Forest was regarded by many as one of the last of the great individualistic inventors; his companies spent fortunes in fighting over patent rights. Several litigations were carried all the way to the U.S. Supreme Court. He had a deep appreciation of the cultural opportunities of broadcasting and deplored its commercialization. "What have you gentlemen done with my child?" he once asked radio executives. "The radio was conceived as a potent instrumentality for culture, fine music, the uplifting of America's mass intelligence. You have debased this child, you have sent him out in the streets in rags of ragtime, tatters of jive and boogie-woogie, to collect money from all and sundry."

Despite his distaste for the uses of radio, de Forest believed strongly in the future of electronics and participated in its development almost to his death; his last work was on the improvement of magnetic tapes and in thermoelectricity. He received his last patent (on an automatic telephone dialing device) at the age of eighty-four.

De Forest was married four times; his last wife was Marie Mosquini, a motion picture actress, whom he married in 1930 and who survived him. When the Foothill Electronics Museum in Los Altos Hills, California, was established in 1969, she donated his papers and many artifacts to it.

BIBLIOGRAPHY

De Forest's autobiography, somewhat immodestly titled *Father of Radio* (Chicago, 1950), contains his 1920 paper on the history of the triode and a list of most of his U.S. patents. Obituaries are in *New York Times* (2 July 1961), pp. 1 ff.; and in *Proceedings of the Institute of Radio Engineers*, **49** (Oct. 1961), 22A. For a well-documented account of the development of the triode, see B. F. Miessner, *The Early History of Radio Guidance* (San Francisco, 1964).

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